

FOUNDATION REVIEW

DIVISION OF ENGINEERING SERVICES GEOTECHNICAL SERVICES

To: **Structure Design**

1. Design
2. R.E. Pending File
3. Specifications & Estimates
4. File

Geotechnical Services

1. GD - North ; South ; West
2. GS File Room

Date: 8/30/07

Camino Del Norte UC
Structure Name

11-50-15-M35.17
District County Route km Post

District Project Development

District Project Engineer

11-080901 57-0930
E.A. Number Structure Number

Foundation Report By: H. Valencia

Dated: 7/10/02

Reviewed By: S. O'Hill

(SD)

R. Price

(GS)

General Plan Dated: 8/10/02

Foundation Plan Dated: 8/15/02

☒ No changes. ☐ The following changes are necessary.

FOUNDATION CHECKLIST

☒ Pile Types and Design Loads
☒ Pile Lengths
☒ Predrilling
☒ Pile Load Test
☒ Substitution of H Piles For
Concrete Piles ☐ Yes ☒ No

☒ Footing Elevations, Design Loads, and Locations
☒ Seismic Data
☒ Location of Adjacent Structures and Utilities
☒ Stability of Cuts or Fills
☒ Fill Time Delay

☒ Effect of Fills on Abutments and Bents
☒ Fill Surcharge
☒ Approach Paving Slabs
☒ Scour
☒ Ground Water
☒ Tremie Seals/Type D Excavation

Structure Design

Bridge Design Branch No. 15

Geotechnical Services

Memorandum

*Flex your power!
Be energy efficient!*

To: MICHAEL D. KEEVER, CHIEF
Structures Design
Office of Bridge Design South
Bridge Design Branch 15
MS - 9-3/3G

Date: July 10, 2002

File: 11-SD-15-KP35.3
11-080901
Camino Del Norte UC - Widen
Br. No. 57-0930

Attention: Surjit Dhillon

From: DEPARTMENT OF TRANSPORTATION
DIVISION OF ENGINEERING SERVICES
Geotechnical Services
Office of Geotechnical Design - South MS #5

Subject: Final Foundation Recommendations

JUL 15 REC'D

Introduction

This report presents the foundation recommendations for the proposed widening of the Camino Del Norte Undercrossing (Widen), Br. No. 57-930. The Structure Foundations 2, Branch F (SF2BF) of the Office of Geotechnical Design South (OGDS) completed a foundation investigation pursuant to the October 9, 2001 request by the Office of Bridge Design South (OBDS) for a foundation investigation and recommendations for the proposed widening.

The following foundation recommendations are based on the subsurface information gathered during the recent foundation investigation (December 2001/January 2002) along with a review of the previous foundation reports, "As-Built" records and Log of Test Borings (LOTB) for the existing bridges. With regards to the current foundation recommendations given in this report, elevations are based on NAVD 88 vertical datum and horizontal coordinates are based on CCS 83 horizontal datum.

Project / Site Description

The proposed structure site is located on Route 15 between Rancho Bernardo and Ranch Penasquitos areas. At the structure site, Route 15 presently consists of a 8 lane divided highway with a northbound (right) bridge and southbound (left) bridge. The existing bridges were originally constructed in 1982 and consist of two-span, cast-in-place, pre-stressed concrete box girder structures supported on Cast-in-Drilled Hole (CIDH) pile foundations.

The current project will widen the left structure approximately 19 m toward the west and approximately 15 m to the east. It will also widen the right structure approximately 2 m to the east. In general, the widening is expected to match the existing structure support lines.

The layout of the proposed widened structure is shown on the Camino Del Norte, General Plans No. 1 and No. 2, provided by OBDS and dated April 2, 2002 and May 31, 2002, respectively.

Geology

The foundation investigation performed for the proposed widening consisted of two mud rotary, sampled borings advanced with wireline-diamond coring methods to a maximum depth of 20.0 m (65.5 ft). At the structure site, approximately 12 m to 14m of fill is present below the highway grade and approximately 4 to 5.5 m of fill is present below the Camino Del Norte Road grade.

In general, the geology at the proposed bridge site consists of fill earth materials underlain by Eocene sedimentary rock consisting of variably soft to moderately hard siltstone and sandstone.

The December 2001/January 2002 foundation investigation revealed that earth materials encountered at the site can be generally separated into three units. The upper unit is a thin layer of fill material consisting of silty/clayey sand, sandy clay and lean clay. These fill soils extend from the ground surface to a depth of 11.9 meters (elevation 216.1 m) in Boring B-1-01 and to a depth of 5.5 meters (elevation 214.2 m) in Boring B-2-02. Below the upper unit, a 2 m thick layer of stiff clay was encountered in both borings. The lower unit consists of slightly to moderately weathered clayey/silty sandstone and siltstone. This unit is typically soft to moderately soft with localized moderately hard and hard zones. During the 1976 foundation investigation for the existing structure, similar earth materials were identified at the site.

Groundwater was measured in Boring B-01-01 at elevation 213.2 m. As-Built information indicates that water was measured between elevation 208.0 m (682.5 ft-NGVD 29) and elevation 206.0 m (676.0 ft-NGVD 29). Scour is not considered to be a problem at this site.

Corrosion

Soil samples collected during the foundation investigation were combined from one boring (B-1-01) to make a composite sample of native earth materials at depth. The Office of Testing and Technology Services, Corrosive Technology Branch (CTB) tested the composite sample for corrosive potential. The results of the laboratory tests determined that the composite sample was corrosive. Refer to Table 1 below for specific test results.

Table 1: Corrosion Test Summary-Composite Samples for Boring B-1-01

Support Location/ Corrosion Number	Sample Depth (m)	pH	Minimum Resistivity (Ohm-Cm)	Sulfate Content (PPM)*	Chloride Content (PPM)*	Years To Perforation 18 ga. Galv. Steel Culvert
Abut 3 / 02-0014	0 to 4.9	8.5	770	85	13	N/A
Abut 3 / 02-0015	11.0 to 14.0	7.8	470	56	221	N/A
Abut 3 / 02-0016	14.0 to 21.4	8.0	545	80	192	N/A

*The Corrosion Technology Branch policy states that if the minimum resistivity is greater than 1000ohm-cm the sample is considered to be non-corrosive and testing to determine sulfate and chloride contents are not performed.

At the request of SF2BF, the Corrosion Technology Branch (CTB) has developed corrosion recommendations (dated April 10, 2002) for the proposed widened structure. Specific questions concerning the corrosion recommendations should be directed to Susan Hall at 916-227-7009 or Douglas Parks at 916-227-7007.

Seismic Data

The site is potentially subject to strong ground motions from nearby earthquake sources during the design life of the new structure. The Newport-Inglewood Rose Canyon Fault/E (NIE, Strike-Slip) fault located approximately 21 km west from the site is the controlling fault for this site with a maximum credible earthquake of $M_w=7$. The Peak Bedrock Acceleration at this site, based on the Caltrans California Seismic Hazard Map, is estimated to be 0.3g. At this site, the liquefaction potential is considered to be minimal.

For site specific seismic data and design recommendations, refer to the memorandum concerning final seismic design recommendations dated April 15, 2002, by Hossain Salami of the Office of Geotechnical Earthquake Engineering.

"As-Built" Information

The original foundation report (1976) and As-Built records (1982) indicate that the bridge foundations for both structures consist of Cast-in-Drilled Hole (CIDH) piles at all support locations. At all structure supports except Abutment 1 (Right Br.), 400-mm diameter CIDH piles with a design load of 625 kN (70 tons) were used for support. At Abutment 1 (Right Br.), 610-mm diameter CIDH piles with a design load of 625 kN (70 tons) were used for support due to the presence of a 1.2m-diameter sewer line. The specified tip elevations provided by the Office of Engineering Geology in 1976 for both bridges are listed below in Table 2.

Table 2. Pile Data: 400-mm Diameter CIDH Piles with 625 kN (70 ton) Design Load

Support Location	Specified Tip Elevation (based on NGVD 29 Vertical Datum)	
	Right Bridge	Left Bridge
Abutment 1	213.4 m (700 ft) *	207.9 m (682 ft)
Bent 2	207.3 m (680 ft)	207.9 m (682 ft)
Abutment 3	209.7 m (688 ft)	209.1 m (686 ft)

* Abutment 1, Right Bridge used a 600-mm diameter CIDH pile with a 625 kN (70 ton) design load.

Foundation Recommendations

Proposed Foundations for Bridge Widening

The following recommendations are for the proposed widening of the Camino Del Norte Undercrossings, Bridge No. 57-930, as shown on the "General Plan No. 1 and No. 2" provided by OBDS and dated April 2, 2002 and May 31, 2002, respectively. At all support locations, it is possible to utilize 610-mm Cast-In-Drilled-Hole (CIDH) piles for support. The specified pile tip elevations are listed below in Table 3. The ultimate geotechnical pile capacity for the CIDH piles will meet or exceed the required nominal resistance in compression and tension listed below in Table 3.

Table 3. Pile Data: 610-mm Cast-In-Drilled Hole Concrete Pile

Location	Pile Type	Design Loading	Nominal Resistance		Bottom of Pile Cap Elevation (m)	Design Tip Elevation (m)	Specified Tip Elevation (m)
			Compression	Tension			
Abutment 1 Left Widening	610 mm CIDH	725 kN	N/A	N/A	225.0	207.9 (1)	207.9
Abutment 1 Center Widening	610 mm CIDH	775 kN	N/A	N/A	224.8	207.8 (1)	207.8
Abutment 1 Right Widening	610 mm CIDH	675 kN	N/A	N/A	225.0	207.9 (1)	207.9
Bent 2 Left Widening	610 mm CIDH	N/A	1750 kN	850 kN	217.6	206.9 (1) 208.8 (2)	206.9
Bent 2 Center Widening	610 mm CIDH	N/A	1750 kN	0 kN	218.6	207.9 (1)	207.9
Abutment 3 Left Widening	610 mm CIDH	800 kN	N/A	N/A	224.4	208.8 (1)	208.8
Abutment 3 Center Widening	610 mm CIDH	750 kN	N/A	N/A	223.9	208.4 (1)	208.4
Abutment 3 Right Widening	610 mm CIDH	950 kN	N/A	N/A	224.1	208.5 (1)	208.5

Note: Design tip elevation is controlled by the following demands: (1) Compression, (2) Tension.
 Load information provided by OBDS on July 3, 2002.

Geotechnical Analysis of Existing Foundations

At the request of OBDS, the existing 400-mm diameter CIDH piles at Bent 2, Right Bridge were evaluated to determine the theoretical geotechnical nominal resistance that could be generated based on the pile dimensions and with less than 12.7mm of settlement. Two soil profiles near the above mentioned support were used to determine a range of possible capacities that could be developed based on the existing pile dimensions.

Table 4. Pile Data: 400-mm Concrete Pile

Support Location	Calculated Geotechnical Nominal Resistance Pile Cut-Off Elev = 217.9m, "As-Built" Pile Tip Elev = 207.3m (NAVD 29)	
	Low Range	High Range
Bent 2, Right Br.	1521 kN	1841 kN

The calculated geotechnical nominal resistance mentioned above is independent of the existing CIDH pile's ability to adequately carry that load. It is the responsibility of OBDS to determine if the existing CIDH pile can structurally carry the increased loading due to the proposed widening.

General Notes

1. All support locations are to be plotted on the Log of Test Borings, in plan view, as stated in "Memos to Designers" 4-2. The plotting of the support locations should be made prior to the foundation review.
2. The proposed widening design should incorporate a closure pour to allow for any differential settlement to occur after post stressing and removal of the false work.

Construction Considerations

1. Due to the granular nature of the soils, primary settlement is expected to occur immediately and concurrent with fill placement; therefore, no waiting period is required prior to installing abutment piles.
2. The calculated geotechnical capacity of the CIDH piles is based upon Skin Friction and End Bearing. Due to the end bearing requirements of the CIDH piles, the bottom of the drilled hole is to be cleaned out, inspected and approved by the engineer prior to placement of the cage and concrete. Also, because of the end bearing requirements for the CIDH piles, if any piles are drilled beyond the specified pile tip elevation, the reinforcement is to be extended accordingly.
3. Caving conditions may be encountered during CIDH pile construction. Temporary casing may be necessary to control caving during construction. All temporary casing is to be removed during concrete placement.

4. Groundwater was encountered during drilling of the 1976 and 2001 test borings and it is anticipated that groundwater will be encountered during CIDH pile construction.
5. De-watering of drilled pile excavations is anticipated to be feasible at all support locations, where groundwater is encountered. The contractor is to be required to keep drilled excavations dry, where groundwater is encountered by pumping methods, immediately after the boring has reached specified tip until the time concrete is placed for construction of the pile.
6. Difficult pile installation and drilling is anticipated due to the presence of hard sandstone zones within the softer clayey siltstone formational rock described in the geology section.

The recommendations contained in this report are based on specific project information regarding design loads and structure location that has been provided by OBDS. If any conceptual changes are made during final project design, the Office of Geotechnical Design South, Structure Foundations 2 Branch F should review those changes to determine if these foundation recommendations are still applicable. Any questions regarding the above recommendations should be directed to the attention of Hector Valencia (916) 227-4555 (CALNET 498-4555) or Mark DeSalvatore (916) 227-5391 (CALNET 498-5391), Office of Geotechnical Design South, Structure Foundations 2 Branch F.

Prepared by:

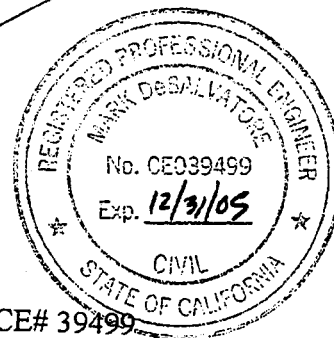
Date: 7-10-02

Supervised by:

Date: 7/11/02



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MICHAEL D. KEEVER
July 10, 2002
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Camino Del Norte - Widen
Br. No. 57-0930
11-080901

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